We claim:

1) An improved process for the preparation of at least one primary alcohol by the hydrogenation of an unsaturated aldehyde reaction product produced by an aqueous base-catalyzed crossed-aldol reaction between a first aldehyde containing 3-5 carbons and a second aldehyde containing 6-11 carbons, the improvement comprising enhancing the selectivity of the crossed-aldol condensation reaction through the use of a water-soluble phase-transfer catalyst.

2) The process of claim 1, wherein the 3-5 carbon aldehyde is propionaldehyde, n-butyraldehyde, isovaleraldehyde, or valeraldehyde.

3) The process of claim 1, wherein 2,4-diethyloctanol is produced concurrently with 2-ethylhexanol via the hydrogenation of 2-ethyl-2-hexenal and 2,4-diethyl-2-octenal produced from an aldol condensation reaction, which makes use of n-butyraldehyde and 2-ethylhexanal as the reactant aldehydes.

4) The process of claim 3, wherein the molar ratio of 2-ethylhexanal to n-butyraldehyde fed to the crossed-aldol condensation reaction is about 1 to about 5.

5) The process of claim 3, wherein the molar ratio of 2-ethylhexanal to n-butyraldehyde fed to the crossed-aldol condensation reaction is about 1 to about 10.

6) The process of claim 3, wherein said 2-ethylhexanal is produced by partial hydrogenation of 2-ethyl-2-hexenal using a Group VIII metal catalyst, said 2-ethyl-2-hexenal being produced by an aldol condensation reaction of n-butytraldehyde.

7) The process of claim 3, wherein a portion of the unreacted 2-ethylhexanal and 2-ethyl-2-hexenal are recovered from the crossed-aldol condensation reaction product in preference to hydrogenation to 2-ethylhexanol.

8) The process of claim 7, wherein 2-ethylhexanal is produced by the Group VIII metal catalyzed partial hydrogenation of said recovered 2-ethyl-2-hexenal.

9) The process of claim 8, wherein the Group VIII metal is palladium.

10) The process of claim 1, wherein the water soluble phase-transfer catalyst is a quaternary ammonium or phosphonium salt.

11) The process of claim 1, the improvement further comprising removing the phase-transfer catalyst from the reaction product by water washing.

12) The process of claim 11, wherein the phase-transfer catalyst is recovered from the water washing by the addition of an alkali metal hydroxide to the water washing to a concentration of 2.5 to 12.5 molar, thereby producing a first phase containing the majority of the phase-transfer catalyst and a second aqueous alkali metal hydroxide phase.

13) The process of claim 12, wherein the alkali metal hydroxide is sodium hydroxide.

14) The process of claim 10, wherein the cationic portion of the phase-transfer catalyst is methyltributylammonium, tetrabutylammonium, benzyltriethylammonium, ethyltributylammonium, tetraethylammonium, tetrahexylammonium, tetrapropylammonium, or tetrabutylphosphonium.

15) The process of claim 10, wherein the anionic portion of the phase-transfer catalyst is chloride, bromide, iodide, bisulfate, sulfate, or hydroxide.

16) The process of claim 1, wherein the aqueous base is an alkali metal hydroxide.

17) The process of claim 16, wherein the alkali metal hydroxide is sodium hydroxide or potassium hydroxide.

18) The process of claim 17 wherein, a 10-50 weight percent solution of sodium hydroxide is used.

19) The process of claim 1, wherein the aqueous base is the hydroxide form of a quaternary ammonium or phosphonium salt.

20) The process of claim 1, wherein the aldol reaction is performed at a temperature from about 30 to 100 °C.

21) The process of claim 1, wherein the aldol reaction is performed at a temperature from about 30 to about 120 °C.

22) The process of claim 1, wherein the crossed-aldol reaction takes place in a two-phase system comprising a first organic aldehyde phase and a second aqueous phase, and the phase-transfer catalyst is primarily in the organic aldehyde phase.

23) The process of claim 1, wherein the crossed-aldol reaction takes place in a three-phase system comprising a first organic aldehyde phase, a second aqueous phase, and a third phase containing the majority of the phase-transfer catalyst.

24) The process of claim 1, the molar ratio of phase-transfer catalyst to the first aldehyde is about 0.01 to about 1.

25) The process of claim 1, wherein the molar ratio of aqueous base to the first aldehyde is about 0.1 to about 2.

26) The process of claim 1, wherein the aldol reaction is performed in a continuous or batch reactor.

27) The process of claim 1, wherein the unsaturated aldehyde reaction product is hydrogenated in the gas and/or liquid phase in a single or multistage process.